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RESEARCH ARTICLE
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EFFICACY OF PROPHYLACTIC USE OF ANTIBIOTICS TO AVOID FLARE-UP DURING NON-SURGICAL ROOT CANAL TREATMENT IN TYPE 2 CONTROLLED DIABETIC PATIENTS DIAGNOSED WITH SYMPTOMATIC APICAL PERIODONTITIS

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ABSTRACT

Background: Non-surgical root canal therapy (NS-RCT) for symptomatic apical periodontitis (AP) is more likely to cause flare-ups in type 2 diabetics because to increased infection and inflammation. The role of prophylactic antibiotics in preventing these flare-ups remains uncertain.

Objective: To evaluate the efficacy of antibiotics as a prophylactic measure to prevent flare-ups during non-surgical root canal treatment in patients with Type 2 controlled diabetics with symptomatic apical periodontitis.

Methods: Department of Operative Dentistry and Endodontic, Institute of Dentistry, Liaquat University of Medical and Health Science Jamshoro/Hyderabad did this quasi-experimental research. Two groups were formed from 110 Type 2 controlled diabetics with symptomatic apical periodontitis receiving NS-RCT. The experimental group (n=55) received 2 gm. of Amoxicillin orally one hour before the first visit, whereas the control group (n=55) received no medicine. In this research, flare-up was defined as moderate to severe pain and swelling within 3 days after endodontic visit and required emergency treatment. Patients were instructed to call the operator if they experienced severe pain or swelling. Patients were reminded to return the proforma within 3 days.

Results: The average age of the experiment group of patients was 41.53±8.21 years and in control group was 44.80±7.13 years. Rate of Flare-up was not statistically significant between groups (p=0.999).

Conclusion: Prophylactic antibiotic treatment may not be necessary to prevent post-endodontic flare-ups in controlled type 2 diabetic patients undergoing non-surgical root canal treatment.

Key Words: Symptomatic Apical Periodontitis, Prophylactic use, Non-surgical root canal treatment, Type 2 controlled diabetic

INTRODUCTION

Symptomatic Apical Periodontitis (SAP) is the inflammation of peri-apical tissues, with painful response on biting or percussion and tenderness to palpation, with or without radiographic changes.[1] Non-Surgical Root Canal Treatment (NS-RCT) is the main treatment modality for elimination of the root canal infection.[2] Diabetes mellitus (DM) is a significantly increasing global health problem with most of the population living in low and middle-income countries.[3] Diabetes affects more than 9% of the adult population and diabetic Patients are 1.4 times more likely to develop apical periodontitis.[4] Other factors include increased age, coronary artery disease, post- menopausal osteoporosis, liver cirrhosis and smoking. The prevalence among gender is uncertain with women develop more apical periodontitis.[4] Apical periodontitis if not treated can lead to large bony lesions, sinus tract, periodontal-endodontic lesions, and cyst formation.[5] There is a tendency toward SAP and increased flare-up in patients who receive insulin.[6]

The degree of peri-radicular tissue damage, its severity, and the intensity of the inflammatory response all influence flare-up. Related characteristics include age, gender, apical patency, pulpal and peri-radicular diagnoses, presence of pre-operative discomfort, and number of visits.[7] Among these factors, the role of micro-organisms and their by-products is well recognized.[8] Diabetic patients and individuals after 40 years are more prone to severe infections, delayed healing and increased flare-ups, due to alterations in immune cells, raised pro-inflammatory cytokines and the presence of more infective bacteria in root canals.[9,10] The bacterial species associated with SAP, includes Prevotella, F.nucleatum and Porphyromonas were also isolated from flare- up cases.[11] Flare-up can be prevented by selecting instruments which extrude lesser amount of debris, single visit NS-RCT, keeping the surroundings aseptic and closing the access cavity.[12]

The prophylactic use of antibiotics in endodontics remains a topic of debate, particularly in systemically compromised patients. While antibiotics may help control bacterial spread and inflammation, their routine use must be justified to prevent antimicrobial resistance and unnecessary exposure to adverse drug effects. [13]

There is high prevalence of DM in Pakistan with potentially higher risk of endodontic infections.[14] Since after thorough search, we did not find evidence of studies regarding effectiveness of prophylactic antibiotics in avoidance of endodontic flare-up in controlled diabetic patients undergoing NS-RCT. Therefore, our research is directed towards assessing efficacy of prophylactic antibiotics in prevention of flare-up in controlled diabetic patients.

MATERIAL AND METHODS

With permission from the College of Physician and Surgeon of Pakistan's Research Evaluation Unit (REU), this quasi-experimental study using consecutive non-probability sampling was carried out from May 2024 to February 2025 at the Department of Operative Dentistry and Endodontics, Institute of Dentistry, Liaquat University of Medical and Health Science Jamshoro/Hyderabad. Sample size calculated by OpenEpi sample size calculator. Total sample size was 110 (55 in each group). Sample size for this study was calculated by OpenEpi calculator, based on assumption of ratio of control to exposure is 30%[13] (among diabetic group without prophylactic) and 8%7 (in prophylactic group) with 95% confidence interval, 80% power, a ratio of 1:1 in each group.

Healthy patients (ASA II) of either gender having age range of 30-70 years with type 2 controlled diabetes mellitus having symptoms of symptomatic apical periodontitis undergoing NC-RCT were included in the study. While patients who were pregnant and lactating women, acute and chronic apical abscess or asymptomatic apical periodontitis, retreatment / previously initiated case, patients already taking antibiotics and patients with history of known allergic to Penicillin. The research did not include third molars.

Endodontic diagnosis was based on history, clinical examination, sensibility test (cold test with ethyl-chloride spray) for pulpal status, percussion test, periapical radiograph of the involved tooth; and for diagnosis of Diabetes mellitus, glycosylated Haemoglobin (HbA1c) level was reported. Previous 3 months report was applicable or patient was asked to have new report before initiation of NS-RCT.

Operator explained the nature and purpose of the study. A brief information of examination, treatment protocol, possible side effects of drugs were also provided to the patients and clarifying all the queries. Before starting the procedure, all patients were provided written Informed consent form. A questionnaire was used to record OPD slip number, age in years, gender, pulpal diagnosis, tooth number and glycosylated Haemoglobin (HbA1c) level. Patients were randomly divided to either prophylactic or non-prophylactic antibiotic group by means of LOTTERY METHOD, one hour before treatment. The allocation ratio was 1:1.

An hour before to the first visit, the researcher administered 2gm of amoxicillin orally to the first group (n=55) (experimental group), whereas the second group (n=55) received no medication (control group). Rubber dam isolation and local anaesthesia with 2% lidocaine and 1:00,000 epinephrine were used to start the root canal procedure in accordance with normal procedure. tracing caries removal and access opening using a sterile high-speed handpiece, the DG 16 probe was used to detect the canals. The EAL (electronic apex locator) was used to establish the working length, and the radiograph was verified by tracing the glide route with 10K and 15K files. Biomechanical preparation was done with Niti rotary files M-Pro using 2.5 to 5 % Sodium hypochlorite, Normal saline and a final wash of 17 % EDTA Solution, the canals were dried with Paper Points and intra-canal medication (non-setting Calcium Hydroxide paste) was placed followed by cotton and temporary restoration Cavit placement and occlusion was adjusted. Patient was observed for possible flare-up within 3 days. Contact details were taken and provided to each patient.

At the conclusion of the visit, each patient received a proforma to document their post-operative symptoms. Within three days of the surgery starting, patients must indicate if they experience any discomfort or edoema. The visual analogue pain scale (VAS), which ranges from NO PAIN TO VERY SEVERE discomfort (0 to 100), was used to record the patient's level of discomfort and percussion pain (the patient was instructed by the doctor to tap on her/his teeth with her finger). In this research, flare-up was defined as patients who had moderate to severe pain and/or moderate to severe swelling within three days after their endodontic session and needed immediate emergency treatment. On the proforma, the frequency of pain medication use was also noted. The patients were told not to take any more medicine without telling the researcher, and they were to take one dose of ibuprofen, a pain reliever, following their visit and another after 12 hours. Patients were instructed to get in touch with the operator if they experienced excruciating pain or swelling. Patients were reminded to return the proforma after three days.

SPSS version 20.0 was used for statistical analysis of the data. The mean and standard deviation were computed for quantitative variables such as age and HbA1c. Frequency and percentage were used to indicate qualitative variable such as gender. The chi-square test was used to determine the outcome variable, which includes flare-up between the two groups (control and prophylatic).

RESULTS

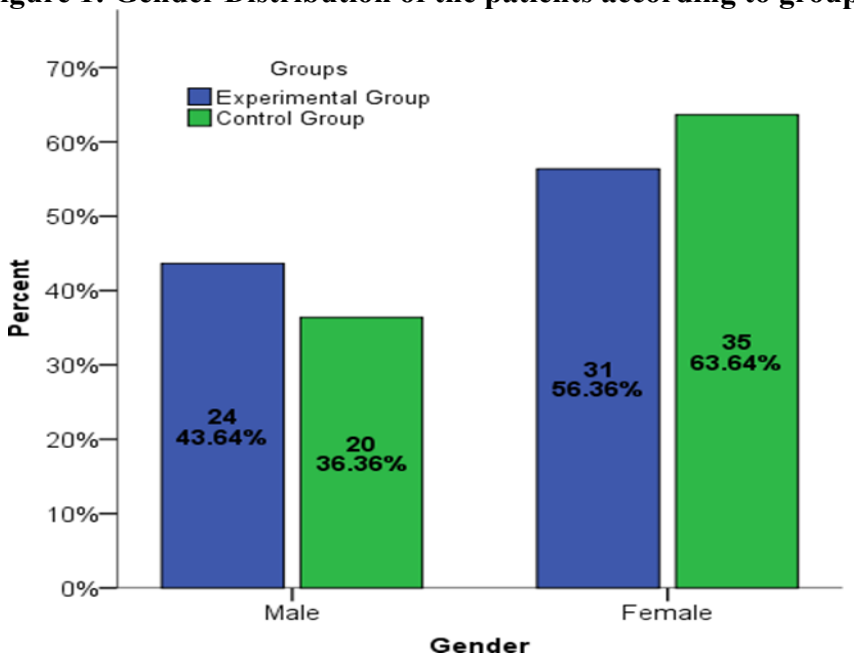
The average age of the experiment group of patients was 41.53±8.21 years and in control group was 44.80±7.13 years, while average HbA1C in experimental group was 5.69±0.66 and 5.66±0.75 in control group as shown in table 1.

Table 1: Demographic characteristics of the patients according to groups

Variables	**Experimental Group n=55**		**Control Group n=55**	
	Mean	Std. Deviation	Mean	Std. Deviation
Age (Years)	41.53	8.21	44.80	7.13
HbA1C (%)	5.69	0.66	5.66	0.75

There were 43.63% male and 56.36% female in experimental group and 36.36% male and 63.64% female in control group (Figure 1).

Figure 1: Gender Distribution of the patients according to groups



There were 50.91% vital pulp diagnosis in experimental group and 43.64% in control as presented in figure 2.

Figure 2: Pulp Diagnosis of the patients according to groups n=110 (55 in each group)

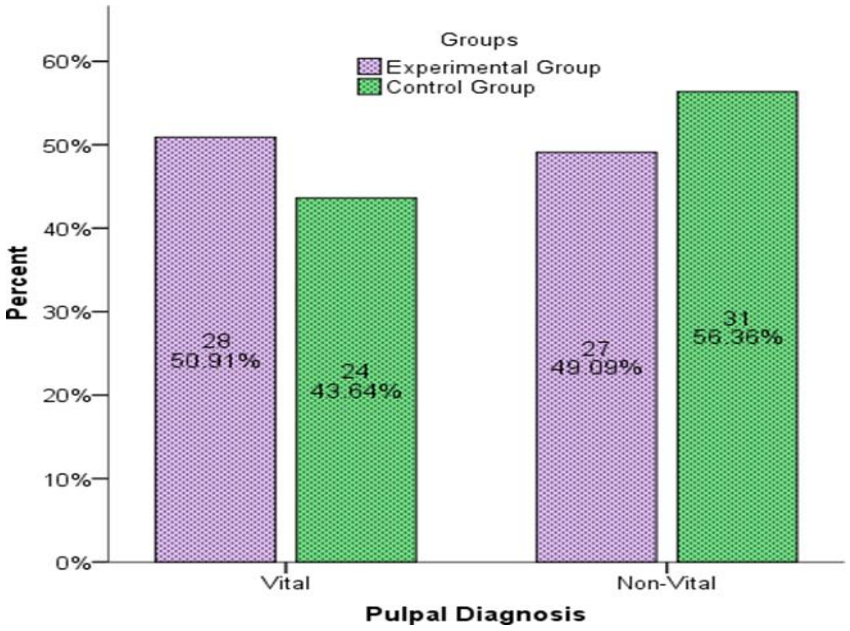


Table 2 illustrates the impact of using antibiotics prophylactically to prevent flare-ups during non-surgical root canal therapy in Type 2 diabetes patients with apical periodontitis symptoms. Between groups, the flare-up rate was not statistically significant (p=0.999).

Table 2: Flare up in experimental and control group

Flare-Up	**Experimental groups n=55**	**Control groups n=55**	P-Value
Present	1(1.8%)	1(1.8%)	0.99
Absent	54(98.2%)	54(98.2%)	

Stratification analysis was performed according to HBA1c as presented in table 3

Table 3: Flare up in relation to HbA1c

HBA1c	Flare-Up	Experimental groups	Control groups	P-Value
≤6	Present	0(0%)	1(2.8%)	0.999
	Absent	31(100%)	35(97.2%)	
	Total	31	36	
>6	Present	1(4.2%)	0(0%)	0.999
	Absent	23(95.8%)	19(100%)	
	Total	24	19	

DISCUSSION

Choosing instrumentation techniques that extrude fewer particles apically, finishing the chemo-mechanical preparation in a single visit, sealing the access cavity in between visits, and preserving an aseptic environment during root canal therapy are some ways to avoid an infectious flare-up. Antibiotics should be used systemically, according to some studies, to avoid flare-ups during or after root canal therapy. [15,16] Due to their rapid absorption, amoxicillin and penicillin are the preferred medications for this use; nevertheless, many individuals who are allergic to these medications are unable to use them. Erythrosine and Flagyl are given to these individuals. The American Heart Association's guidelines are adhered to while administering preventative antibiotics. [16,17]

In this study the average age of the experiment group of patients was 41.53±8.21 years and in control group was 44.80±7.13 years. There were 43.63% male and 56.36% female in experimental group and 36.36% male and 63.64% female in control group. There were 50.91% vital pulp diagnosis in experimental group and 43.64% in control. The demographic characteristics of the study population, including age and gender distribution, were comparable between the experimental and control groups. The prevalence of vital pulp diagnosis was slightly higher in the experimental group, but this difference was not statistically significant.

The current study aimed to evaluate the efficacy of prophylactic antibiotic treatment in preventing post-treatment flare-ups in type 2 diabetic patients undergoing non-surgical root canal treatment. The results of this study indicate that the prophylactic use of antibiotics did not significantly reduce the incidence of flare-ups in this patient population. Some researchers recommended antibiotics to prevent flare-up during or after NS-RCT. The incidence of flare-up in prophylactic group was 8%.7 Penicillin and Amoxicillin are suitable and can be used prophylactically for medically compromised patients.[2] The incidence of flare-up in controlled diabetic group was 30%. The pain assessed for the first 24 hours and the diabetic groups was not classified on the bases of blood glucose level.[13]

Walton and Chiappinelli tested the impact of the preventative penicillin on post-endodontic symptoms in a randomised double-blind research. Three groups of eighty individuals with asymptomatic periapical periodontitis were created. Two grammes of penicillin were given to Group A (26 patients) before to therapy, and one gramme was given six hours following treatment. Group C (30 patients) did not get any medicine, whereas Group B (24 patients) got a placebo along with the same schedule. They collected postoperative symptoms such pain and swelling at 4, 8, 12, 24, and 48 hours using a visual pain analogue and swelling questionnaire. There was just one flare-up, and it occurred in the placebo group. 69% of patients in Group A (penicillin) had mild-to-moderate discomfort, compared to 79% in Group B (placebo) and 70% in Group C (no treatment). Considering problems after therapy, there was no statistically significant difference between these three groups. [18]. The impact of amoxicillin on endodontic flare-up in asymptomatic necrotic teeth was assessed by Pickenpaugh et al. [19]. A single dosage of amoxicillin (3g) was administered to 34 patients one hour before to endodontic treatment, whereas 36 patients were given a placebo. In order to document post-operative discomfort, swelling, and the quantity and kind of painkillers used, each patient was given a notebook. Seven individuals (10%) had a flare-up, with four (57%) in the amoxicillin group and three (43%) in

the placebo group, according to the data. They came to the conclusion that prophylactic amoxicillin had no impact on flare-up incidence.

Clindamycin's effectiveness in preventing postoperative infections was assessed in a different study. Of the 256 patients, 128 were administered 600 mg of clindamycin orally, while the other 128 were given a placebo. One, two, and four weeks after surgery, the patients were assessed. There was no statistically significant difference between the infection rates in the clindamycin group (1.6%) and placebo group (3.2%) [20].

While antibiotics are commonly used to prevent infections, their efficacy in preventing post-endodontic flare-ups remains controversial. Several factors may contribute to this, including the complex nature of endodontic infections, the emergence of antibiotic-resistant bacteria, and the individual patient's immune response.

In type 2 diabetic patients, impaired wound healing and compromised immune function may increase the risk of infection. However, the findings of this study suggest that prophylactic antibiotic treatment may not be sufficient to prevent flare-ups in this patient population

CONCLUSION

In conclusion, the findings of this study suggest that prophylactic antibiotic treatment may not be necessary to prevent post-endodontic flare-ups in type 2 diabetic patients undergoing non-surgical root canal treatment. However, careful patient selection, meticulous endodontic techniques, and appropriate post-operative care remain essential to minimize the risk of complications.

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